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EVALUATION OF EFFECT OF SUBMUCOSAL ADMINISTRATION OF METHYLPREDNISOLONE IN MANAGEMENT OF POSTOPERATIVE SEQUELAE IN MANDIBLE FRACTURE

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ABSTRACT
Objective: To determine the effect of submucosal administration of methylprednisolone in the management of postoperative sequelae in mandibular fractures.
Study Design: Cross sectional study
Setting: Oral & Maxillofacial Surgery Department, Faculty of Dentistry, Liaquat University of Medical & Health Sciences Jamshoro
Period: June 2024 to November 2024
Material & Methods: 72 patients who met the inclusion and exclusion criteria were divided into Group A (Experimental Group) and Group B (Control Group) (36 each group). The experimental group got 40 mg Methylprednisolone submucosally at the surgical site immediately after surgery, whereas the control group did not. All participants in this research had routine surgery under general anaesthesia. The research examined postoperative pain and swelling on the first, third, and seventh days. Standard proforma was used to capture and evaluate the data using SPSS 21.0.
Results: Both Groups A and B included 91.7% and 86.1% male patients. The mean age was 30.44 ± 12.51 years (Group A) and 27.11 ± 11.12 years (Group B). Pre- and post-operative pain on day 1 were similar (P=0.134, P=0.386). Significant differences in postoperative pain were reported on day 3 (P=0.004) and day 7 (P<0.001) between groups. Pre- and post-operative swelling on day 1 did not vary (P=0.508 and P=0.189). Groups showed significant differences in postoperative oedema on day 3 (P<0.001) and day 7 (P<0.001).
Conclusion: Submucosal administration of methylprednisolone in management of postoperative sequelae in mandibular fractures is effective in reducing postoperative pain and swelling.

KEYWORDS: *Mandible Fracture, Postoperative Sequalae, Submucosal Methylprednisolone*

INTRODUCTION

Open reduction and internal fixation are usually required in cases of mandibular fractures, which are a common problem in oral and maxillofacial surgery[1]. Even though this surgical intervention is essential for the normal healing process, it often causes an inflammatory reaction, which in turn leads to substantial postoperative sequelae such as discomfort, oedema, and trismus among other symptoms[2,3]. Not only can these problems give patients a significant amount of agony, but they also have the potential to impair functional recovery and extend the duration of rehabilitation. Therefore, the efficient treatment of these postoperative morbidities is of the utmost importance in order to improve patient outcomes and bring about an overall improvement in the quality of care provided in maxillofacial trauma.[4,5]

A number of different approaches have been investigated in the research literature in order to reduce postoperative inflammation and the symptoms that are linked with it. When it comes to oral and maxillofacial operations, corticosteroids have been used extensively for a number of decades.[6] These steroids are well-known for their powerful anti-inflammatory characteristics[7,8]. Studies have been conducted to explore the effectiveness of various methods and kinds of corticosteroids, such as dexamethasone and methylprednisolone, in lowering pain and swelling after operations such as the extraction of third molars and the repair of mandibular fractures[9,10]. Current research, which includes studies carried out in Pakistan, is continuing to examine the most effective administration strategies and comparative efficiency of these drugs in reducing the amount of pain experienced by patients after surgical procedures[11,12].

The purpose of this research is to determine whether or not the administration of methylprednisolone via the submucosal route is effective in lowering postoperative pain and swelling among patients who have had open reduction and internal fixation of mandibular fractures. To be more specific, we hypothesise that a single dosage

of 40 mg of methylprednisolone that is delivered submucosally would considerably reduce the amount of pain and swelling experienced on postoperative days 3 and 7 in comparison to a control group that does not receive any intervention from this category.

MATERIAL & METHODS

The Department of Oral and Maxillofacial Surgery, Institute of Dentistry, Liaquat University of Medical and Health Sciences, undertook this six-month cross-sectional research from June 1 to November 30, 2024. The Epi Tools epidemiological calculator projected the sample size to be 64.8, but 10% was added to account for likely non-respondents, resulting in 72 patients, 36 in each group. Non-probability convenience sampling was utilized. The research comprised male and female patients aged 15–60 who needed open reduction and internal fixation for mandibular fractures under general anaesthesia. The research excluded patients with systemic diseases or comorbidities, pregnant women, those with a history of systemic steroid use, allergies to any trial medication component, and mandibular condyle or coronoid fractures. After informed permission, clinical and radiological patients were recruited and data were entered on a standardised proforma. Participants were recruited from outpatients needing open reduction and internal fixation for mandibular fractures and randomly assigned to experimental and control groups using sequentially numbered opaque sealed envelopes. The patient and evaluator were study-blind. The control group got no medicine, whereas the experimental group received 40 mg Methylprednisolone submucosally at the surgery site. The same operator conducted all surgeries under general anaesthesia using a standardised approach, ignorant of the research. Different fracture sites did not get extra Methylprednisolone dosages. One blinded observer assessed swelling, pain on the 1st, 3rd, and 7th postoperative days. swelling was quantified using five linear face measures on a plastic measuring tape in mm, and pain severity was recorded with a 10 cm VAS. Patients with a VAS score higher than 5 received Ketorolac 30 mg intramuscularly during the nil per oral period or Diclofenac 50 mg orally once oral intake was authorised. If pain persisted after oral analgesics, rescue analgesia was given. The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0. The independent sample t-test was used to compare differences in pre-operative and postoperative pain between the groups. The chi-square t-test was employed to assess differences in pre-operative and postoperative swelling between the groups.

Ethical Approval: The study was initiated after obtaining ethical approval from the Ethical Review Committee of LUMHS Jamshoro.

RESULTS

A total of 72 patients were analyzed, with 36 in Group A (Experimental) and 36 in Group B (Control). The demographic and baseline clinical characteristics were comparable between the two groups (Table 1 and Table 2).

Table 1: Demographic Distribution of Patients

Variable	Group A (n=36)	Group B (n=36)	P-Value
Gender			
Male	33 (91.7%)	31 (86.1%)	0.453
Female	3 (8.3%)	5 (13.9%)	
Age (Years)			
16-30	23 (63.9%)	24 (66.7%)	0.466
31-45	8 (22.2%)	10 (27.8%)	
46-60	5 (13.9%)	2 (5.6%)	
Mean Age ± SD	30.44 ± 12.51	27.11 ± 11.12	0.236

Table 2: Pre-operative Clinical Status

Variable	Group A (n=36)	Group B (n=36)	P-Value
Pre-op Pain (VAS)			0.053
Mild	3 (8.3%)	10 (27.8%)	

Variable	Group A (n=36)	Group B (n=36)	P-Value
Moderate	30 (83.3%)	21 (58.3%)	
Severe	3 (8.3%)	5 (13.9%)	
Pre-op Swelling			
Mild	22 (61.1%)	19 (52.8%)	0.508
Moderate	14 (38.9%)	16 (44.4%)	
Severe	0 (0.0%)	1 (2.8%)	

Regarding postoperative pain, there was no statistically significant difference on Day 1 (P=0.386). However, Group A showed significantly lower pain scores on Day 3 (P=0.004) and Day 7 (P<0.001) compared to Group B (Table 3).

Table 3: Postoperative Pain Distribution (VAS)

Time Point	Severity	Group A (n=36)	Group B (n=36)	P-Value
Day 1	Mild	0 (0.0%)	2 (5.6%)	
	Moderate	22 (61.1%)	22 (61.1%)	0.341
	Severe	14 (38.9%)	12 (33.3%)	
Day 3	Mild	17 (47.2%)	4 (11.1%)	0.001
	Moderate	19 (52.8%)	32 (88.9%)	
Day 7	No Pain	12 (33.3%)	3 (8.3%)	
	Mild	24 (66.7%)	32 (88.9%)	0.023
	Moderate	0 (0.0%)	1 (2.8%)	

Postoperative swelling followed a similar trend, with no significant difference on Day 1 (P=0.189), but highly significant reductions in Group A on Day 3 and Day 7 (P<0.001) (Table 4).

Table 4: Postoperative Swelling Distribution

Time Point	Severity	Group A (n=36)	Group B (n=36)	P-Value
Day 1	Mild	9 (25.0%)	9 (25.0%)	
	Moderate	25 (69.4%)	20 (55.6%)	0.189
	Severe	2 (5.6%)	7 (19.4%)	
Day 3	Mild	22 (61.1%)	0 (0.0%)	<0.001
	Moderate	14 (38.9%)	24 (66.7%)	
	Severe	0 (0.0%)	12 (33.3%)	
Day 7	Mild	36 (100.0%)	13 (36.1%)	<0.001
	Moderate	0 (0.0%)	23 (63.9%)	

DISCUSSION

The results of this research show that administering submucosal methylprednisolone significantly reduces postoperative pain and swelling after open reduction and internal fixation of mandibular fractures. Our findings demonstrate that while there was no statistically significant difference between the experimental and control groups in terms of acute postoperative pain and swelling (Day 1), the methylprednisolone group showed a substantial decrease in both parameters by Day 3 and Day 7. This implies that the corticosteroid has a long-lasting anti-inflammatory action, which is essential for patient comfort and recuperation throughout the subacute stage of healing.

These findings are consistent with a larger body of research that supports the use of corticosteroids to treat postoperative complications after oral and maxillofacial surgery. For example, research on impacted third molar surgery has repeatedly demonstrated that corticosteroids, such as methylprednisolone and dexamethasone, can successfully reduce trismus, pain, and swelling[13,14]. These findings are extended in the current study to mandibular fracture repair, a more involved surgical procedure that frequently results in a more severe inflammatory reaction. As used in this trial, the submucosal route of administration provides a targeted delivery approach that may reduce systemic adverse effects while optimizing therapeutic concentrations at the surgery site. The sustained effect of methylprednisolone is clinically valuable, and the significant differences seen on Days 3 and 7 in our study are especially noteworthy because these time points frequently indicate the peak of inflammatory resolution and patient discomfort.

This study's particular emphasis on submucosal delivery of methylprednisolone for mandibular fractures is one of its novel and significant features. Although corticosteroids are frequently used, the best method and dosage for particular maxillofacial procedures are always being improved[15]. Strong evidence for the long-term advantages of this targeted strategy is shown by the demonstration of a significant reduction in pain and edema at later postoperative stages (Day 3 and Day 7). Improved patient compliance, an earlier functional recovery, and a decreased demand for additional analgesic drugs, such as opioids—a increasing problem in postoperative care could result from this[16].

In a related research, Kandamani et al. found that administering depomedrol (methylprednisolone) submucosally to treat postoperative sequelae in mandibular fractures significantly reduced swelling, trismus, and pain in the depomedrol group as compared to the control group[17]. Considering the other studies such as Warraich et al.,Weber et al.,and Alfertshofer M, with the safe use of higher doses of steroids, additional studies should be performed after controlling for other variables, such as oral hygiene, to determine the effective and safe dose[18,19,20]. Submucosal administration will also lower the risk of systemic toxicity. These related investigations support the conclusion that methylprednisolone administered submucosally effectively reduces postoperative pain and edema in the treatment of mandibular fracture sequelae.

CONCLUSION

The study found that methylprednisolone administered submucosally effectively reduces postoperative pain and swelling in the treatment of mandibular fracture sequelae. When methylprednisolone was administered subcutaneously to treat mandibular fracture postoperative sequelae, postoperative pain and swelling on days three and seven were considerably reduced.

DECLARATIONS

Ethics Approval and Consent to Participate: The study was approved by the Ethical Review Committee of Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro. Written informed consent was obtained from all participants (or their legal guardians, where applicable) prior to enrollment.

Consent for Publication: Not applicable.

Availability of Data and Materials: The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest: The author declares no conflict of interest.

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Author Contributions: The author was responsible for study conception and design, data collection, analysis and interpretation of results, drafting of the manuscript, and final approval of the version to be published.

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